Integrating Testing and Training

Conflict or Synergy?

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Overview

- Is Change Needed?
- Perceived Problems
- Misconceptions
- A Productive Approach

Why Change Anything?

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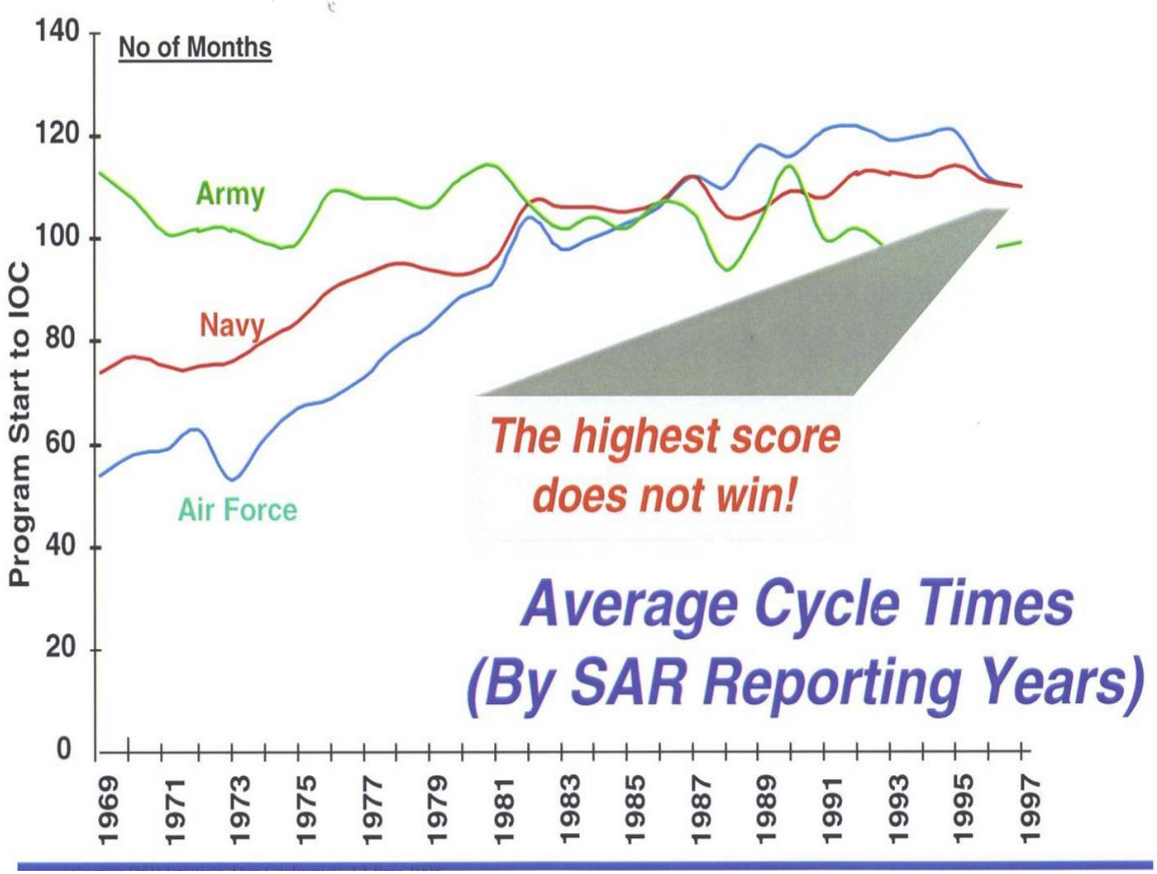
- Numerous commissions, Chiefs of Staff, staffers, congresshumans have criticized the testing process
- Testing, at the end of the cycle, is often seen as the delaying element
- The bearer of bad tidings is often seen as the cause of the problem
- Our political masters continue to seek the magic

bining testing and training will be the (a) magic a

1970 Blue Ribbon Commission

- Customary to think of OT&E as physical testing
- OT&E must extend over the life of the system and incorporate analytical studies, ops research, systems analysis, component testing and ultimately full system testing
- There is no effective method for conducting OT&E that cuts across service lines, although in most combat environments the U.S. must conduct combined operations
- Because funds earmarked for OT&E do not have separate status in the budget they are often vulnerable to diversion to other purposes


No of Months
Program Start to IOC
140
120
100
80
60
40
20
0
Army
Navy
Air Force
The highest score does not win!
Average Cycle Times
(By SAR Reporting Years)
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997

Perceived Problem

- Serial, “big-bang” solution drives cycle time
- Difficult to adjust requirements to reflect asymmetric threats or warfighter “use and learn” experience
- No requirement for collaboration among various players (users, acquirers, testers, etc.)
- Technology reach too long and process lacks flexibility for timely insertion
- Too much time for things to go wrong (budget instability, schedule changes, cost increases, etc.)

Concerns (F-22)

- Single demonstrations of spec's cannot characterize the distribution of values
- There is limited testing beyond the planned flight envelope prior to DIOT&E
- Avionics test plan relies heavily on the Flying Test Bed and the effectiveness of this testing cannot be determined until installed system performance is evaluated
- The entire test program is heavily success-oriented with little margin for error
- Blue-only EW testing is problematic and may have to be revisited in view of ACS validation needs
- Unclear as to how extensively DT will examine all Red/Gray threats to include fusion and display while stressed

Concerns (F-22) (cont)

- There were no references to interoperability; no mention of operational effectiveness with USN, USA or coalition forces
- Unique reliance on ACS for key OT requirements intensifies the importance of ACS fidelity
- Considerable integrated sensor capability will never be flight tested due the very practical limitations of open-air ranges

Another Approach

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- Plan and implement seamless verification
  - No duplication or graduation exercise
  - Operational assessment concurrent with DT
- Independent Operational Assessments for each spiral (vice dedicated OT)
  - Focus on the essentials
  - Useable, not perfect, combat capability
- Approach requires detailed, up front collaborative planning
  - Living up to commitments is key
  - Early tester engagement

Pathfinder Concept

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1. Correlate technology, technology transition and concept development to "task-force effects" (AFMC/CC and SAF/AQ)
2. Create collaborative spiral requirements and program management process (SAF/AQ and AF/XO)
3. Perform testing as one integrated DT/OT verification process (AFOTEC/CC)
4. Institutionalize funding stability (SECAF/CSAF)
5. Continue sustainment transformation (AF/IL and AFMC/CC)

A Full-Spectrum Assault on Cycle-Time Process Drivers

Combine DT/OT?

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- Observations
  - Too much duplication among DT and OT
    - Our philosophy is to treat them as separate and distinct
  - Combined DT/OT concept not universally adopted
  - Too often, OT hides under "Title 10" umbrella
  - OT "Graduation Exercise" mentality draws on resources and lengthens schedule
  - OT and Warfighters not always in agreement
- Premise
  - Incorporating DT and OT into an end-to-end system verification process will consume less time and resources

System Verification?

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- Design single test verification strategy
  - Integrate DT/OT objectives into single test verification plan – maximize meeting mutual objectives
  - Use "Collaborative" Operational Assessments to validate each spiral
    - Satisfies Title 10 intent – sometimes dedicated OT can be a single sortie
  - Collaborative with AFOTEC, MAJCOM, and Developer
- Expected Outcome
  - Shorter test schedule
  - Incremental Ops Assessments vice large dedicated OT

Commercial Testing

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"The testing and evaluation of weapon systems in the defense procurement process is done for entirely different reasons than in the commercial world. In the commercial world, **the reason for testing and evaluating a new item is to determine where it will not work** and to continuously improve it. **One tests equipment outside of its boundaries, that is, to intentionally create failures, in order to learn from them.** Again, the assumption is that product development will go ahead unless major problems are found. Thus testing and evaluation is primarily for the purpose of making the best possible product, and making it as robust as possible, that is, insensitive to variations in the manufacturing process or even to misuse and abuse by users."

Jacques S. Gansler
Defense Conversion
1995

DoD Testing

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"By contrast, testing and evaluation in the Department of Defense has tended to be a final exam, or an audit, to determine if a product works. Tests are not seen as a critical element in enhancing the development process; tests therefore are designed not to fail. In this way very little is learned through the testing and evaluation process; the assumption is that the product will work and it usually does. Under these conditions, the less testing the better - preferably none at all. This rather perverse use of testing causes huge cost and time increases on the defense side, since tests are postponed until the final exam and flaws are

Jacques S. Gansler
Defense Conversion
1995

Circa 1998

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The Operational T&E Community is emphasizing Testing for Learning:

- Early involvement, especially early operational assessments
- Modeling and simulation
- ACTDs
- DT + OT *(CTF)*
- Experimentation, notably AWEs and Battle Labs
- OT with training *(e.g., exercises)*

DoD 5000.2-R
OT&E

8. Operational Test Agencies shall participate early in program development to provide operational insights to the program office and to acquisition decision makers.
9. Operational testing and evaluation shall be structured to take maximum advantage of training and exercise activities to increase the realism and scope of operational testing and to reduce testing costs. The Director, Operational Test and Evaluation shall: (1), assess the adequacy of OT&E and LFT&E conducted in support of acquisition program decisions, and (2) evaluate the operational effectiveness, operational suitability and survivability, as applicable, of systems under OT&E oversight.

Dod 500.2R (current)

Operational Test and Evaluation Overview

(1) The primary purpose of operational test and evaluation is to determine whether systems are operationally effective and suitable for the intended use by representative users before production or deployment.

(2) The TEMP shall show how program schedule, test management structure, and required resources are related to operational requirements, critical operational issues, test objectives, and milestone decision points. Testing shall evaluate the system (operated by typical users) in an environment as operationally realistic as possible, including threat representative hostile forces and the expected range of natural environmental conditions.

Where Are We?

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- Speed up testing
- Don’t spend too much money
- Be operationally realistic
- Evaluate against user requirements, using typical operators
- Point out all the problems (DoD)
- Don’t fail the system (Services)

Test during training exercises?

- Perceived reduced cost of testing
- Enhances realism
- Lots of typical operational users
- May provide opportunity to look at jointness, interoperability
- Introduces new equipment to operators

Considerations

- Operational Testing and experimentation are different
  - Experiment to discover
  - Test to characterize, prove, validate
- Training is intended to practice for operations using fielded systems
- Many systems cannot be tested in exercises
  - JASSM, e.g.

Joint Air-to-Surface Standoff Missile

JASSM Summary

- (U) Precision, penetrating, LO cruise missile
- (U) MME: # missiles needed to kill targets based on reliability, survivability, lethality
- (U) Evaluate MME with validated M&S
  - Validate with test data and intelligence
  - Insufficient resources to test

Conflicting Venues?

- Testing during training exercises
  - New (prototype) capabilities may distort training
  - Test article can/must be separated from the body of training (e.g., J-STARS in NTC)
- Combine training with test and experimentation?
  - Who are you training?
  - Potential benefit – identify new TTP

Summary

- Testing on training ranges
  - Technology is the answer
- Testing in training exercises
  - Feasible, if carefully separated
- Training during test and experimentation
  - Scenario dependent, most useful to gain insight into TTP

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Conclusion

Combining testing and training requires:

- An operational concept
- Funding
- Technological infrastructure